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# Media coverage of four Carbon Capture and Storage (CCS) projects in Germany: analysis of 1,115 regional newspaper articles

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## Abstract

The results presented in this article illustrate how the local public was informed on specific Carbon Capture and Storage (CCS) projects by regional newspapers in Germany. The analyzed articles were published in four daily newspapers within the German regions where four CO<sub>2</sub> onshore storage projects took place or have been planned. The articles were published between 2007 and 2011. In total, 1,115 newspaper articles about the four CO<sub>2</sub> onshore storage projects were gathered and analyzed both qualitatively and quantitatively. Our results showed that the regional media coverage of CCS projects in Germany reached peaks in 2009 and 2010. The main topics changed within the media coverage and it is worth mentioning to what extent the media coverage of CCS disregarded topics with regard to economic, technical, ecological or scientific aspects on CCS. The overall evaluation of CCS within the articles is negative. While commercial CCS projects received more negative evaluation across newspaper articles; opinions about the research and industry project Ketzin were more neutral.

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**Keywords:** CCS; CO<sub>2</sub> onshore storage; public perception; media coverage; Germany

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## 1. Introduction

Research results from regional studies about the public perception of CCS in Germany already exist; e.g. for a formally planned commercial size CCS project (in the district of North Frisia) and also for an existing project (CO<sub>2</sub>SINK at Ketzin). The results were generated on both quantitatively and qualitatively analyses based on

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interview data [1,2]. They revealed that on a regional level the awareness regarding CCS is higher compared to a nationwide level, and that the attitudes regarding CCS are comparatively more negative.

With the exception of the Ketzin area (a district in Havelland, Brandenburg), protest against CO<sub>2</sub> storage projects on the regional level in Germany has been considerable. However, the studies published so far mostly measured public perceptions of CO<sub>2</sub> storage projects at one single point in time, i.e. they are not able to mirror public perceptions of those projects over time. An approach that is able to fill this gap is a media analysis. This paper, therefore, analyzes whether regional newspapers report on CCS and – if applicable – the upcoming protests, to what extent the protests were announced within newspaper articles, how CCS topics were framed, and how the CCS media coverage evolves in the course of time. We also investigated in how far federal political and legal debates on CCS were addressed in relation to the regional projects. The results presented below point out how the public was informed on specific CCS projects by regional newspapers in Germany.

The analyzed articles were published in regional daily newspapers, which were distributed within the German regions where four CO<sub>2</sub> onshore storage projects took place or have been planned. Three of these projects were already finished without injecting CO<sub>2</sub>. The four CO<sub>2</sub> onshore storage projects considered in our analyses were:

1. “Commercial project North Frisia”: Led by RWE, a major energy company; to be combined with joint research project “COAST”: long-term aim was to store CO<sub>2</sub> from RWE’s coal fired power plants; active project preparations from 2008 to 2010 accompanied by local protests, officially given up in 2011; no field activity at all, research project not started.
2. “Research and industry project Altmark”: close cooperation of industry project by Gas de France SUEZ (GDF SUEZ) and Vattenfall with joint research project “CLEAN”: cooperation aimed at combining Enhanced Gas Recovery (EGR) with CO<sub>2</sub> storage in nearly depleted natural gas-field; project run time from 2009 to 2011 accompanied by local protest from 2010; necessary technical installations for storage were put into place, however, no permission issued for CO<sub>2</sub> injection (goal: 100.000 t). Finished without CO<sub>2</sub> injection, but extensive scientific research was conducted.
3. “Commercial project East Brandenburg”: Led by Vattenfall, a major energy company; long-term aim was to store CO<sub>2</sub> from Vattenfall’s coal fired power plants; active project preparations from 2009 to 2012 accompanied by local protests; no field activity at all.
4. “Joint research project Ketzin” (CO<sub>2</sub>SINK): Injection of a limited amount of CO<sub>2</sub> (max. 100.000 t, CO<sub>2</sub> injected >70.000 t) under the site of a former natural gas storage site. Runtime of several research projects from 2004 until today. Currently closing down activities. No local protests.

Hence, the main goal of all four projects was to examine the feasibility of CO<sub>2</sub> storage in Germany. In the end, only one project (joint research project Ketzin) has ever injected CO<sub>2</sub>. All applied projects led by industry or significantly driven by industry in Germany were cancelled prematurely or ended without CO<sub>2</sub> injection.

## 2. Methods

The data set comprises articles from four regional daily newspapers, which were distributed within the German regions where CCS projects took place or were planned. The newspapers were widely circulated; that means the print runs and also the distribution areas were comparatively high, so that in total, 1,115 newspaper articles about the four CO<sub>2</sub> onshore storage projects were gathered. The analyzed articles were published between 2007 and 2011. The search time for the relevant articles within the newspaper archives varied according to the different project periods and activities:

1. “Commercial project North Frisia” from March 2008 to December 2011,

2. “Research and industry project Altmark” from July 2008 to December 2011,
3. “Commercial project East Brandenburg” from March 2009 to December 2011 and
4. “Joint research project Ketzin” from March 2007 to March 2010.

The analyzed articles refer to at least one specific CCS project, just a few articles refer to more than one project. The data analysis was carried out by the following predefined variables and parameter values, see Tabl. 1.

Table 1. Variables and parameter values of media analysis.

Variables	Parameter values
Formal variables:	
-Name of newspaper	Official name of newspaper
-Date of publication	Year, month, day
-Type of article	Detailed report, short report, announcement, comment, interview, letter to the editor, hybrid form, other
-Distribution	Complete edition, tranche, both
Content variables:	
-Name of CCS project	Official name of CCS project
-Main topic	Protest against CCS, information towards specific CCS project, presentations/informative events about CCS, political process(es) regarding CCS, economical aspects on CCS, scientific aspects on CCS, technical aspects on CCS, legal aspects on CCS, ecological aspects on CCS, other contexts irrespective of CCS
- Other topic	Protest against CCS, information towards specific CCS project, presentations/informative events about CCS, political process(es) regarding CCS, economical aspects on CCS, scientific aspects on CCS, technical aspects on CCS, legal aspects on CCS, ecological aspects on CCS, other contexts irrespective of CCS
-Mentioned actor(s)	Initiator, citizens' initiative
-Announcement of protest activity in headline	Yes, no
Evaluation variables:	
-Style of speech	Negative, rather negative, neutral, rather positive, positive
-Evaluation towards CCS within the headline	Negative, rather negative, neutral, rather positive, positive
-Overall evaluation towards CCS within the article	Negative, rather negative, neutral, rather positive, positive

The newspaper articles were coded and analyzed with SPSS, which is a common and recognized software for statistical analysis. The quantitative part of the analysis comprised the main part, in which we identified by means of frequency distributions for example the type of articles, the main topics and the main mentioned actors. Within the qualitative analysis we conducted a content analysis to determine the dominant framing of CCS, characterized by terminologies, style of speech and metaphors.

### 3. Results

In this section, we point out the results of our quantitative and qualitative analyses. The analyses show to which extent regional newspapers reported on four CO<sub>2</sub>-storage projects in Germany, how CCS topics were framed and how the CCS media coverage evolved in the course of time. The results also exhibit to what extent citizens'

initiatives against the projects and operating company or initiators were announced within the newspaper articles. Finally, we present the overall evaluation on CCS within the media coverage on CCS projects in Germany.

### 3.1. Main topics addressed by the media regarding CCS over time

The focus of our media analysis was targeted at a description of the main topics addressed by the media regarding CCS. The analysis of the results reveals that the most frequently mentioned topics regarding CCS address the “political processes” (28.3 %), followed by the topic “protest against CCS” (24.1 %) and “information towards specific CCS project(s)” (15.6 %), see Fig. 1.

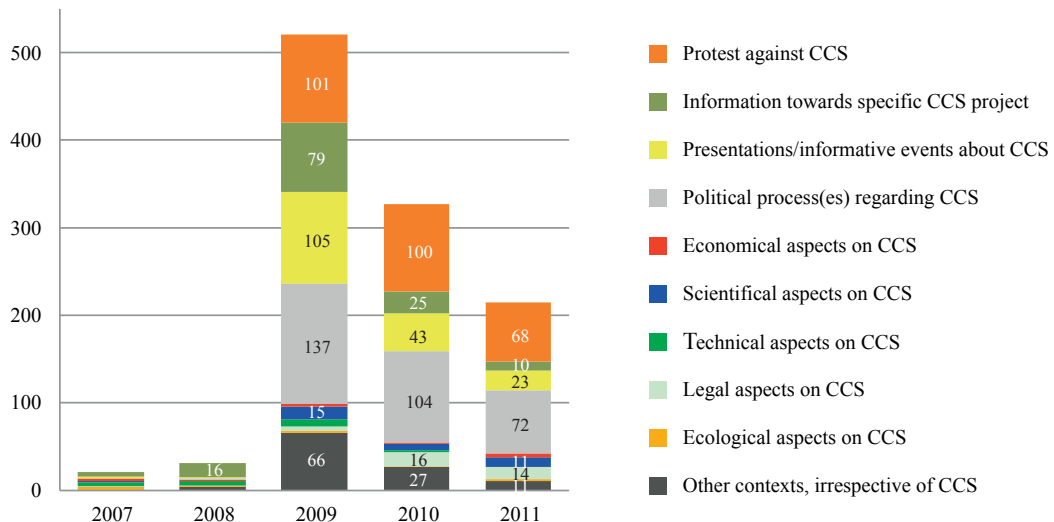


Fig.1. Absolute frequency of main topics addressed from 2007 to 2011 in four regional newspapers in Germany (N=1,115)

It is worth mentioning to what extent the media coverage of CCS disregarded other topics, for example economic, technical, ecological or scientific aspects on CCS. Within the analyzed time-frame, a change regarding the main topics becomes apparent: the media coverage from 2007 to 2008 mainly focused on information regarding the specific CCS projects, while articles about the protest against CCS were not present in this period. Since 2009 articles about the protest against CCS, the political process(es) regarding CCS and presentations or informative events about CCS dominated the media coverage regarding CCS.

Factors which explain the change of topics could not be investigated systematically within the analysis of this media coverage. However, the legislative process in Germany to pass a law on CCS was strongly triggered by the European CCS Directive process, introduced in April 2009. The legislative process in Germany failed in June 2009 mainly due to the discussions within and among the political parties and the upcoming regional protests against CCS [3], see Fig. 2. The results of the analyzed articles also confirm, that the CCS legislative process was associated with an emerging political discussion from regional up to national level. It can be assumed that these developments were relevant for the change of CCS topics within the regional media coverage in 2009, and they also fostered the increase in the frequency of articles about CCS.

The frequency of articles regarding the four CCS projects varies from 2007 to 2011. 46.7 % (N=521) of all analyzed articles were published in 2009, afterwards the total number of articles decreases continuously, see Fig. 2.

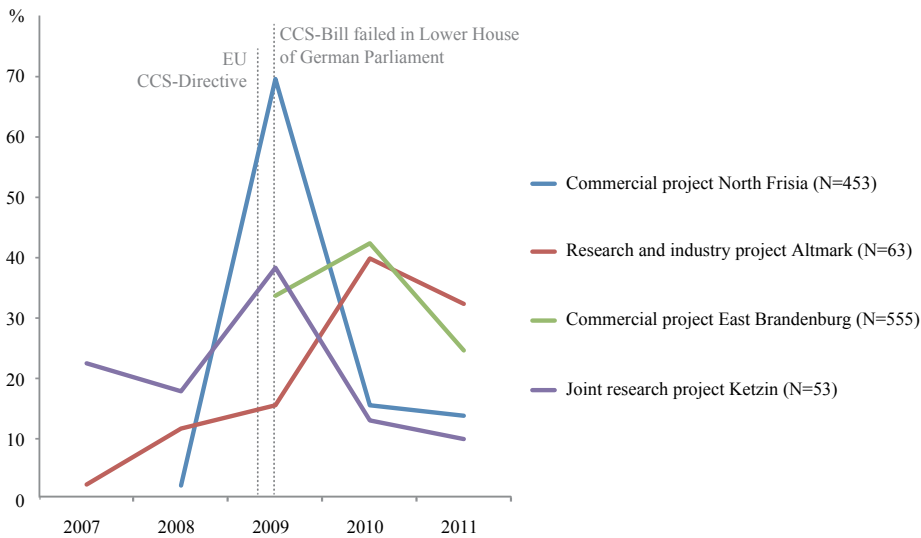


Fig. 2. CCS projects mentioned in newspaper articles over time (N=1,124, multiple answers)

### 3.2. Main topics addressed by the media coverage regarding the four CCS projects in Germany

The results of our analysis show that the main topics addressed by the media differ along the four CCS projects in Germany. The following differences become apparent comparing the four CCS projects: The media coverage of the “research and industry project Altmark” and the “commercial project East-Brandenburg” was dominated by the topic “political process(es) regarding CCS” (43.4 % for “research and industry project Altmark” and 34.4 % for the “commercial project East-Brandenburg”), see Tab. 2. For the “commercial project North Frisia”, the topic “presentations/informative events about CCS” was reported most frequently (24.1 %), and for the “joint research project Ketzin” the topic “information towards specific CCS project” was communicated most frequently (38.1 %) by the newspapers. Following the topic “political process(es) regarding CCS”, the second most frequently mentioned topic in the media coverage on CCS was “protest against CCS” for all projects but the one in Ketzin. For the “joint research project Ketzin” the topic “protest against CCS” was only mentioned in rare cases (3.2 %).

Table 2. Percentages of main topics regarding the media coverage on CCS projects in Germany.

Main Topics	Com. project North Frisia (N=453)	Research/industry project Altmark (N=53)	Com. project E. Brandenburg (N=555)	Joint research project Ketzin (N=63)
Protest against CCS	22.3	13.2	29.2	3.2
Information towards specific CCS project	13.2	11.3	9.4	38.1
Presentations/informative events about CCS	24.1	9.4	9.9	11.1
Political process(es) regarding CCS	22.3	43.4	34.4	12.7
Economical aspects on CCS	0.4	0.0	1.1	4.8
Scientific aspects on CCS	1.8	3.8	3.2	7.9
Technical aspects on CCS	0.7	5.7	1.3	6.3
Legal aspects on CCS	1.5	5.7	4.5	3.2
Ecological aspects on CCS	0.9	3.8	0.0	3.2
Other contents, irrespective of CCS	12.8	3.8	7.0	9.5

### 3.3. Mentioned actors within the media coverage on CCS projects in Germany

In each case, one operating company or one initiator represented one particular CCS project, often as a substitute for a whole project consortium. In 53.6 % of all analyzed CCS articles (N=1,115), at least one operator was mentioned. The most frequently mentioned operator was Vattenfall, which was in charge of the “commercial project East Brandenburg” (37.3 %, N=416), followed by RWE for the “commercial project North Frisia” (15.6 %, N=174). Hence, the operators of the two major energy companies in Germany were mentioned comparatively often within the media coverage on CCS. GFZ Potsdam, which is a scientific research institution and the initiator for the “joint research project Ketzin” was mentioned in 4.6 % (N=51) of all articles. The initiator of the “research and industry project Altmark” consisted of a close cooperation with partner from GFZ, from an industry project by Gas de France SUEZ (GDF SUEZ) and from Vattenfall with the joint research project “CLEAN” which was mentioned only in 0.8 % (N=9) of all articles.

The results of the media analysis revealed that in 32.4 % of all articles (N=1,115), citizens’ initiatives against the projects were mentioned; in 3.1 % of the articles two citizens’ initiatives against the projects were named. The three citizens’ initiatives which were mentioned most frequently within the articles opposed against the “commercial project North Frisia” and the “commercial project East Brandenburg”. Regarding the last project, seven different citizens’ initiatives against the project were mentioned in total during the analyzed period. For the “commercial project North Frisia” four citizens’ initiatives against the projects were contemplated. The initiatives against the projects used the media coverage on CCS to announce several informative events and demonstrations within their respective vicinity. The analysis of media coverage on the “research and industry project Altmark” bore just one citizens’ initiative against the project. For the “joint research project Ketzin” no single citizens’ initiative against the project was mentioned within the respective media coverage on CCS. This is in line with the finding by Dutschke et al. [4] that the “joint research project Ketzin” proceeded and still proceeds without any protests from the regional public (e.g. demonstration, hearing).

### 3.4. Overall evaluation of CCS within the media coverage on CCS projects in Germany

In addition to the different reported topics on CCS and the mentioned actors, the overall evaluation of CCS within the articles was analyzed. The overall evaluation of CCS illustrated how CCS was perceived and represented from a medial point of view. The following results distinguish between the evaluations regarding the four CCS projects in the headlines and in the articles.

The headlines of newspaper articles have an announcement effect; they should pique the readers’ curiosity and finally lead them to read the full article. In 661 of all analyzed articles (N=1,115), the headline mentioned the CCS technology or an unambiguous synonym. The evaluation of CCS within the headlines, without differentiation regarding the four projects, was predominately negative (57.6 %). Neutral (36.8 %) and positive (5.6 %) evaluation of CCS was comparatively rare. This means that in total, the media perceived and represented CCS negatively within the headlines of the analyzed articles.

With regard to the four specific projects, the results reveal that the evaluation of CCS in terms of the commercial projects and the research and industry project is predominately negative in the headlines of the articles, from 72.1 % (“commercial project North Frisia”) to 50.0 % (“commercial project East-Brandenburg”), see Fig. 3. Whereas the evaluation of CCS in the headlines of the “joint research project Ketzin” is mainly neutral (52.3 %).

The overall evaluation of CCS within the articles was also negative; that means in 66.4 % of all analyzed articles (N=887) a negative evaluation was predominant. 27.2 % of the articles evaluated CCS as neutral, and only 6.4 % perceived CCS as positive.

Regarding the four specific projects, the results reveal that the overall evaluation of CCS apparently differs between commercial and more exploratory projects: The articles referring to commercial projects exhibit a negative evaluation of CCS from 85.9 % (“commercial project North Frisia”) to 56.4 % (“commercial project East-Brandenburg”); with regard to the “joint research project Ketzin” only 21.9 % of the articles perceived CCS as negative, see Fig. 4.

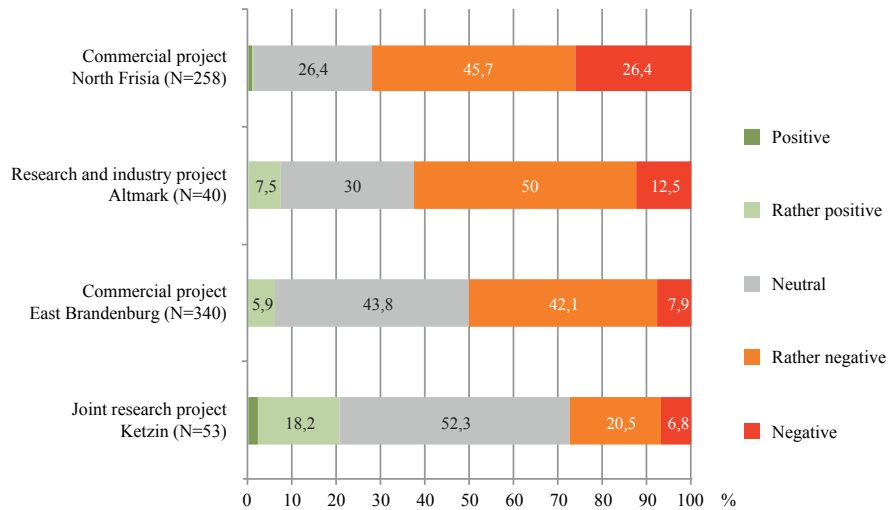


Fig. 3. Frequency (percentage) of evaluation regarding the four CCS projects in Germany within the headline

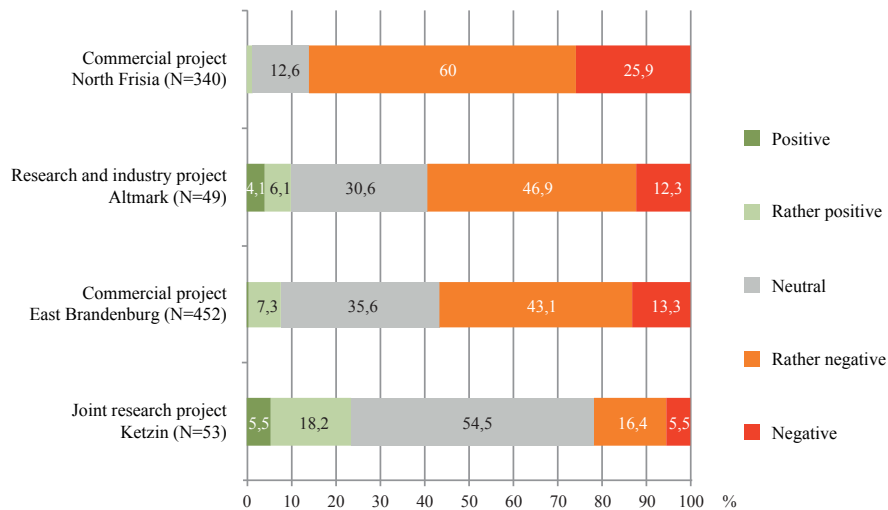


Fig. 4 Frequency (percentage) of overall evaluation regarding the four CCS projects in Germany within the articles

The style of speech with regard to CCS within the analyzed articles was predominately neutral (88.4 %, N=1,114). The value “neutral” was given when the style of speech within the respective article was objective and arguments (negative or positive) on CCS were expressed by citation, that means the authors’ opinion on CCS were unidentifiable. A negative style of speech concerning CCS was apparent in 10.7 % (sum of values “negative” and “rather negative”) and a positive style of speech was identified in just ten articles (0.9 %, sum of values “positive” and “rather positive”).

The results illustrate that concerning the four specific projects, the articles with regard to the “commercial project North Frisia” were slightly more frequently negative compared to the style of speech on CCS within the other projects, see Tabl. 3.

Table 3. Style of speech within the analyzed articles on four CCS projects in Germany (percentages)

Style of speech	Com. project North Frisia (N=453)	Research/industry project Altmark (N=53)	Com. project E. Brandenburg (N=555)	Joint research project Ketzin (N=63)
Negative	2.0	0	0.2	3.2
Rather negative	14.3	11.3	6.3	6.3
Neutral	82.6	88.7	93.0	87.3
Rather positive	1.1	0	0.5	3.2
Positive	0	0	0	0

#### 4. Summary

The regional media coverage of CCS mainly took place in 2009 and 2010. Regarding the specific projects, the main phase of media coverage varied between 2009 and 2010. In the course of 2011, the media coverage on CCS depleted continuously. The content of media coverage was mainly concentrated on the political processes concerning CCS and the protest activities against CCS on a regional level. Other CCS-related topics, like economic or ecological aspects, were disregarded by German media in the project regions.

The overall evaluation regarding the CCS projects in Germany was predominately negative, but the degree of negativity depended on the specific project. Commercial CCS projects received more negative evaluation across newspaper articles, while the “joint research project Ketzin” was evaluated more neutral. Compared to the overall evaluation of CCS within the articles, the style of speech is predominately neutral. Thus, the findings from media analyses are in line with case study work [2, 4] done on the four projects which pointed to a good acceptance of the Ketzin-project by the local community and documented critical responses from local stakeholders and the public for the other three projects.

Media coverage is crucial for public understanding of CCS technology [5]. Research has found that public knowledge of emerging technologies and related policy issues are influenced by media framing [6]. Nevertheless, on the basis of these analyses we are not able to draw conclusions to what extent the regional media coverage of CCS was a decisive factor for the acceptance on or the rejections and the protests against the four CO<sub>2</sub> onshore storage projects. Hence, further research on the perception and acceptance on CCS should investigate the effects on media coverage of CCS as one potential factor amongst others.

#### Acknowledgements

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